The Building of A "Sliding-Box" Camera For The Making of Paper Negatives

By - James R. Kyle
(Revised = 2019)

The ***"sliding-box"*** type of camera was first used around 1838 to about 1850. This camera type was used by two of the "fathers" of photography - namely, ***Louis Jacques Mandé Daguerre*** of Paris, France, inventor of the *"Daguerreotype Photographic Process"* - and, ***William Henry Fox Talbot***, inventor of the *"Paper Negative Process"*, of Lacock Abby, England.. (These were the first cameras used till they were replaced by the "Bellows Focusing" system about 1850.)

Because of it's simplicity, the "sliding-box" camera is one of the less expensive, and easiest to build. The only one that is easier to construct would be a "shoe-box camera", made out of a - shoe-box. A **"Pinhole"** is used for a "lens", which would project an image on to a sheet of photographic light sensitive paper at the rear of the box (also called a pin-hole camera). These *"cameras"* are a lot of fun and usually the first *camera* that anyone can make - but, **not** a very sharp and **clear** image. The sliding-box was about the same, in it's shape, however, it employed a glass lens to project the image on to the light sensitive medium. Later on the glass lens would be refined with the addition of ***"selective holes"*** - called ***"apertures"***. These apertures, when applied correctly, allowed the "selective focusing" of any part of the overall image - this is called ***"Depth of Field"***. The first camera lenses, and up to the invention of the "in-camera" shutter system, had a lens cap which is used to let the light enter the camera body. The "sliding-box" focusing system is just that. Two boxes are slid within one another to attain a sharp image, that is projected onto the "ground glass" focusing screen at the rear of the camera. When the "Film Holder" is placed into the rear of the camera, the same distance as the ground glass the intended image will be in focus.

When I first saw a "Sliding-Box" camera, I was very interested in one making of my own. It took almost 40 years from that time till now to get the time and the wanting to do so. And herein, this paper, I have detailed my construction, attempts, failures, and most importantly - my successes. Anyone can build this type of camera with simple hand tools, and little knowledge of woodworking. (However, it is easier with a powered "table-saw".) As of the writing of this paper, I have made 4 similar models. Model #1 is simple sliding-box camera with the addition of a "spring-back" film loading attachment from a "Speed Graphic" 4X5 Graflex Press Camera. It was beyond simple repair and I only kept it for a collection of cameras. The next addition was a brass lens, with a shutter - made in 1901. Model #2, feathers a covered back on the "movable box" that is hinged to permit viewing of the intended image, to focus and compose on the ground glass focal plane. I cut a "slot" to admit a "film holder" that I placed a sheet of ground glass to view and focus the image. This slot also is where the film holder is placed that contains the light sensitive paper that will record the image. The focal plane is located near the rear of the movable box. Also, guide rails on the front "sliding box" that will permit straight and unencumbered moment for ease of focusing.

Both models operate the same as any view camera - except for the moments of "up and down", "tilt and shift" of the "standards" (rear and front parts of the camera). (As these two models are built on the basic principals of the early cameras, before the "Scheimpflug principle" was developed, in 1909 by Theodor Scheimpflug.) These camera designs are not a "true" box camera - like a Kodak Brownie © or a Kodak Hawkeye © that have a fixed focus lens - these can manually be adjusted to attain a true focus on the selected subject. And with the aperture adjustment that one may make use of, a selective focus is attained.

The first concern is that of the distance required for the focal distance. This distance is attained by placing the lens in front of a white sheet of paper in the back of a cardboard box and the lens pointed at an object over 300 feet distance. By moving the lens away, or toward, the paper until a sharp image is found. Measure this distance, and that shall be the "infinitive distance". The closer that the camera is from the object to be photographed, the more distance will be needed to make the image sharp and clear. (I used a 127mm Graphic lens made by Kodak - This lens measured to be that of 4.75 inches from the white sheet of paper. Thus - This was the infinitive distance. This distance is when the boxes are closed together. Drawing back away from the forward "stationary box" will permit focusing for nearer objects.

This camera I built is of the same principal as the four others I have built in the past, with the exception of the rear is equally square. This shall permit the photographer to use not only horizontal (landscape), but vertical (portrait) as well. There is really no need for an "extensive" workshop. A few simple hand tools will do most of the construction. The main power tools are a powered "saber-saw", a powered miter-saw, and a powered table saw. However, one can get by with "Arm-Strong" powered hand saws.

I do not explain the terms, as anyone may look on-line to get a clear and better explanation of these. By reading the first page, the reader may have, already, a few questions about terms used - Remember, "Goggle Is Your Friend" - Make use of It.

The choice of wood, of my build I used Poplar Wood, some 1/8th inch plywood, glue, screws, and a few small brass nails. The largest cost was the Lens, of which the total camera is built around – You can get these used on E-Bay. And, of curse, the size of the film holder. (In this build, a 4X5 inch film holder is used.)

I have tried to make the photographs as illustrations on what I did. However, if you are experienced with woodworking, you may have a different way of accomplishing the same result. Also the "plans" that I have drawn are NOT Plans, nor where they meant to be. They were just a way of getting the idea down on something that I, and others, could see. I did make changes as I went along with the building - as you might do. You may see some "mistakes" I have made, or you feel that you have a better way to do the build - THAT is totally up to You. You, and You alone, are the builder of Your model. With that said - These "instructions" are Not the only way to do the build - and you are free to do what you think best. (That is my hope that you do.)

The pencil sketches are copied from my "Brainstorming Notebook". I use notebooks as not only a way to remember things, but to just get "stuff" out of my brain that I do not have a need to remember. In so doing, it leaves my mind in a clear state to think of other things more pressing - Like - should I - "Save the Universe..... or Drink a Beer?"

Be that as it may ---- This is my fifth camera, I shall call it the "Sliding-Box" Model 1838-A-5. (The 1838 = for the year of the first sliding-box camera // The letter "A" = for Advanced // The number "5" for the number of cameras that I have built.)

Good luck to you (anyone) who has a desire to build your very own camera.

First Things First - Tools and Stuff

When building ANYTHING = Our hands are the extension of our Mind. Tools, and other useful objects, are the Extension of our Hands. Illustrated (photos) here show the Tools and "Stuff", that I used to build the cameras. You do NOT have to have a very elaborate "Woodworking Shop" - However - You do need TOOLS and some "elbow-room" to do the work properly.

Fig.1

Fig. 2

Figure One -

1. Chisels
a.- 1"
b.- 3/4"
c.- 1/2"

2. File Card (to clean out files)

3. Files

4. Scissors

5. Pocket Knife

6. 90 degree Clamps

7. Combination Square

8. Plastic centering ruler

9. Small hammer

10. Pencils & Markers

Figure Two -

11. Miter Box

12. Hacksaw

13. Drill Motor

14. Drill Bits

15. Sander

16. Electric Saw

17. Hole Cutter

18. Countersink

19. Saw Blades

NOT SHOWN -

Screwdrivers, Pliers, “C”- Clamps, Large Woodworker Clamps
Power Miter-Saw, Table-Saw Safety Goggles, Cup of Coffee, Bottle of Single Malt Scotch.

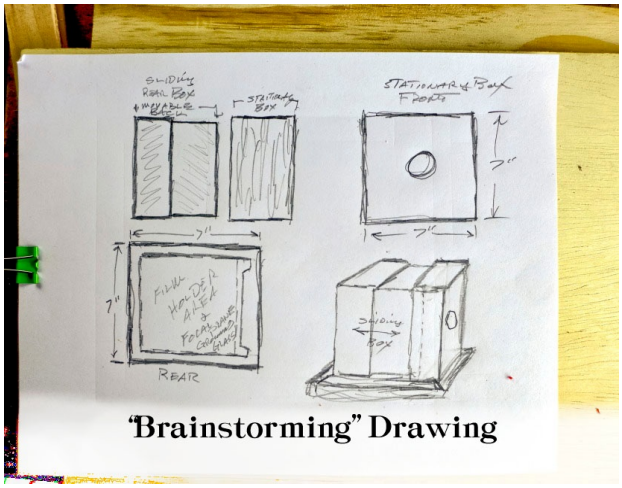
Other materials You Shall require

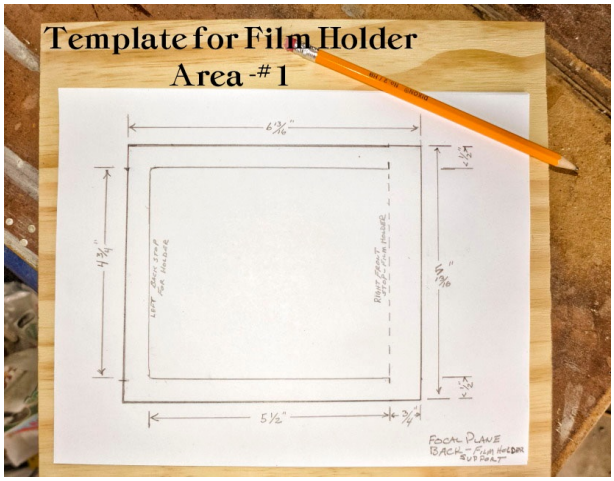
- Materials Needed = Supplies -

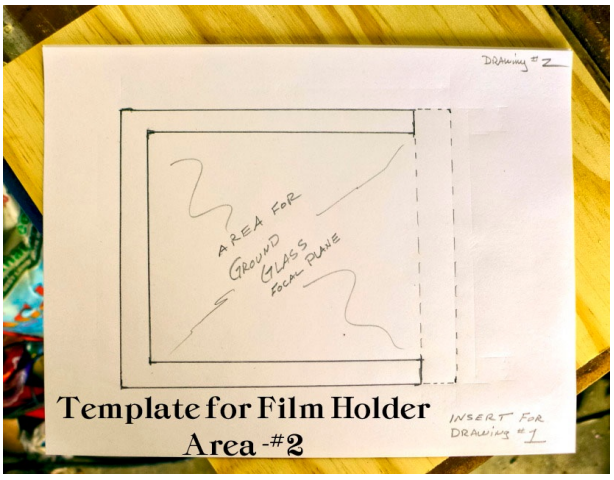
Now! You go out to the Hardware Store. Like most guys, I really like the Hardware Store. Now days this store (if that store is LARGE) has an "Indoor Lumber Yard" ... This is a very good thing. However, you still must look at the lumber to see that there are not "knots" - and (the most difficult) that the boards you ware to select ARE NOT WARPED. If they are warped, go through the entire stock till you find Non-Warped, bent or "bowed", boards. (IF you can Not find a good selection = Go to Another store.) It IS very critical to have straight boards.)

My selection of wood to be used was that of Poplar (Finished Poplar). Sold by the Board Foot. One reason is that it did not have "Knots" and they were straight. Also Poplar wood is very stable, and a medium soft wood. I also picked up some "angle trim" for the front frame of the "stationary box" (forward box).

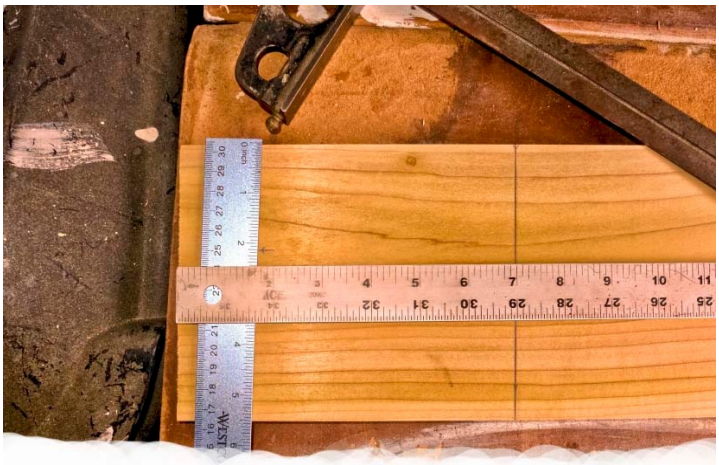
When building ANYTHING - I hear my father's voice echoing from the past - ***"Measure TWICE... CUT ONCE."*** And that is what I advise anyone to do. (Also - When working with ANY electrical powered tools and cut things, bend things, and somehow could cause serious damage (or death) - Use Your Common Sense - Work Safely - THINK BEFORE YOU DO ANYTHING. ((Before switching on the power - Count All of your fingers, four on each hand, with the addition of the apposable thumbs. After the cutting is finished - Count the AGAIN. If any are missing - Pick it (them) up, pack in ice, and get your butt to the emergency room at the nearest hospital.







Photos of the "Thought Process" - i.e = The PLANS I follow. The rest is in my mind, of what to do.



Measuring The Poplar Wood
(Measure Twice - Cut Once.)

Cutting The Wood For The Two
Boxes (Please Follow Safety Rules)

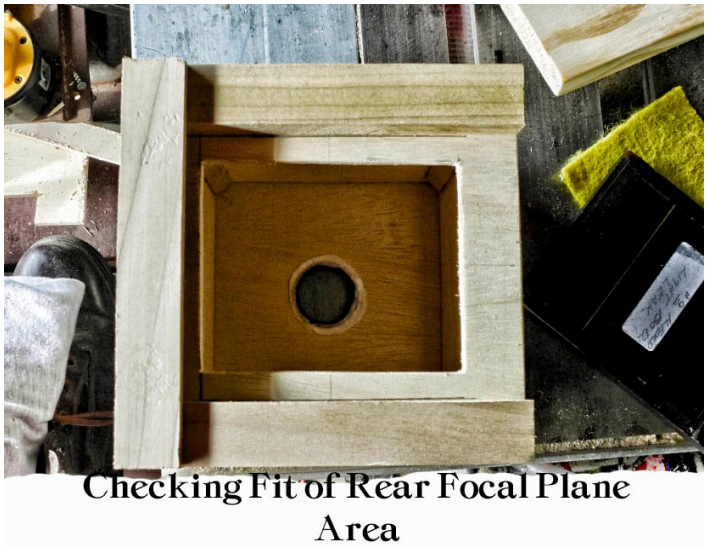
Finished Cutting The Two Boxes

Gluing the Box And Keeping it
Square & Even

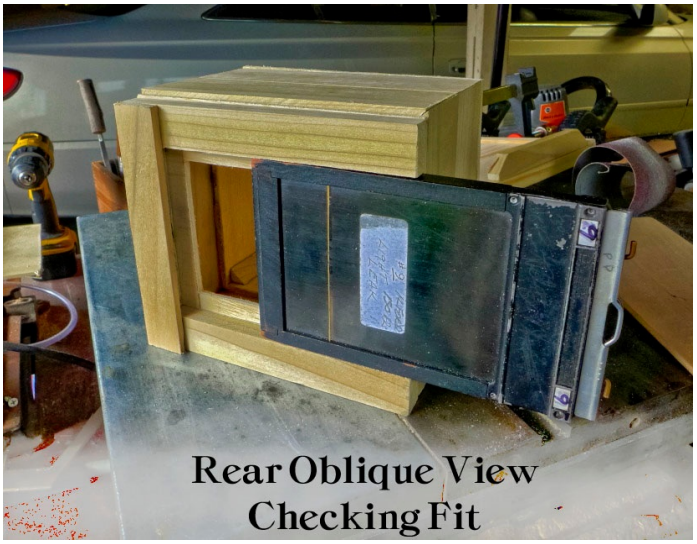
After the Cutting and Glueing - Let the parts sit for 3 to 4 hours. Then return to put the parts together.

"Exploded View"(Coffee Break Time)

Mounting Rear to Camera Body Proper



Checking Fit of Rear Focal Plane Area



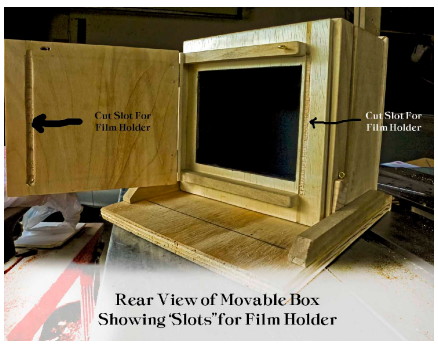
Rear Oblique View Checking Fit

Now is the time to Assemble the cut and finished parts of the two Boxes. Beginning at the Rear of the "Moving box" - Align the Film Holder frame to the box. Checking for extremely Tight Fits. (This is to assure a LIGHT-TIGHT Inside Area, where the Image shall be recorded on the "light sensitive media" used. i.e. film or Photo-Paper.)

Showing Vertical Position (Portrait)

About To Cut A Hole In Lens Board

After the assemblage of the Rear Focal Plain area, Go to the Front of the Stationary-Box and find the center of the "Lens-Board" - to mount the Lens and Threaded Bushing-Lock-Ring on the hole you will cut. I used "expanding glue" for this — One MUST BE VERY CAREFUL - And NOT get glue on the Threads of the Lens proper. ((If you do get this glue on the threads of the lens it is very, VERY, difficult to remove.))



Rear View of Movable Box
Showing 'Slots' for Film Holder

On the Left Cut a Slot for the holding of the film holder to rest in. This will assure a good hold on the film holder, and keep out stray light from fogging the "film" and or Paper. Paint the INSIDE of the boxes with Flat Black spray paint.

Glue Lens Bushing ONLY to Lens Board
(Take Care Not To Use Too Much)

Working Side View
(Right Side)

Glued and Clamped Forward Box Trim

After mounting the lens threaded bushing, remove the lens, and proceed with the finishing Trim on the Forward Box. The use of clamps and rubber bands will hold the trim in place, for the curing of the glue. (Shown are two Brass Decorative Corners placed on the stationary box.)

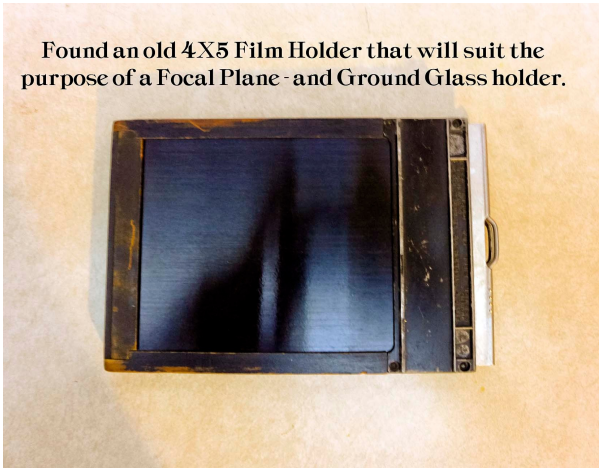
While the glue is curing, mix up some stain for the color of the finish. I use three different stains that I mix at random selection to make a tone that is unique to each camera I make. The selection of stains is totally up to the builder. I also use some Paint Thinner to thin-out the mixed stain. This will assure, not only an even coverage, it will be a little lighter and have better penetration of the wood.

I use a mix of Three Different Stains, Dark Walnut, Cherry, and Ebony
(Every time I mix I use slightly different combinations)

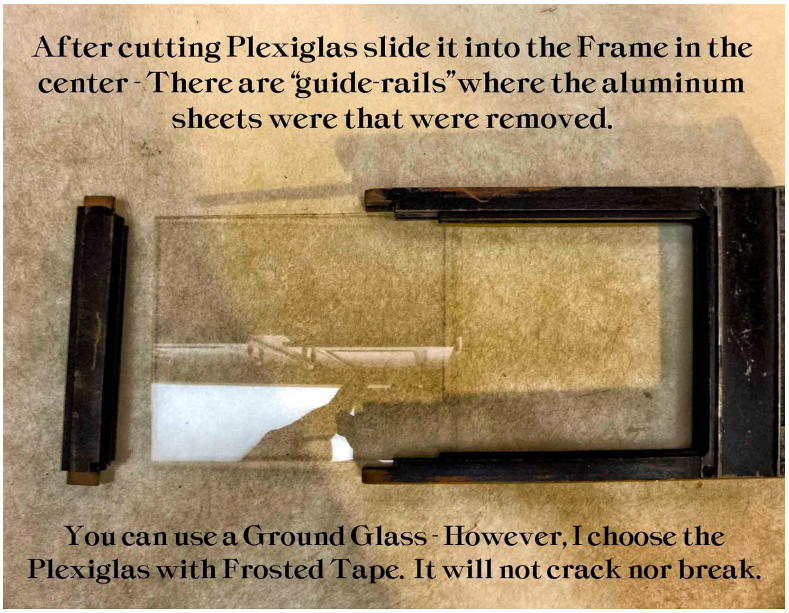
Letting The Stain Dry After Paint Thinner Rubdown

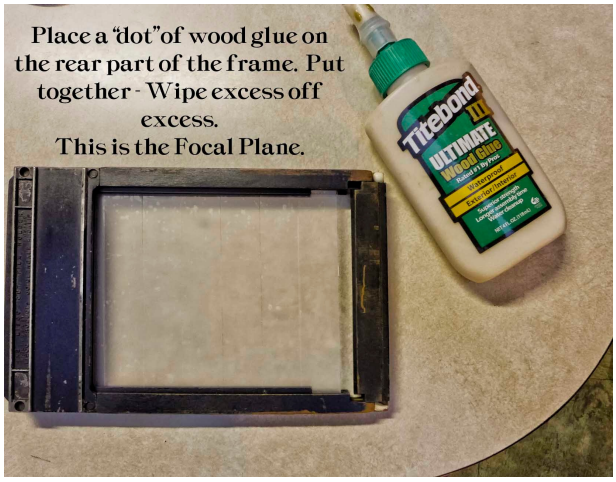
While The stain is drying - Now is a good time to work on the Focal Plane part of the camera. This is were the photographer brings into focus the intended image. And More. This area is were the photographer composes the given, and chosen scene (or subject of interest). Having a few old Wooden Film Holders, I thought that one would make a "Removable Focal Plane". This would contain the "Ground Glass" where the focusing is done. The distance of the Ground Glass and that of the Film in the Holder MUST BE EXACT as to the distance of each other. The tolerance is about a little less than that of One Sixty-fourth (1/64) of an Inch. IF it is NOT exact, the image that is recorded WILL be unclear and blurry. So - One Must be Very Careful as to keep this distance Exact.

If you do not have a Wooden Film Holder - you can get good USED one from "E-Bay". (I did check out to see if one was for sale for "Parts", and found three for $3.00 to $8.00 each. That is a good buy, even better when it says that the seller will Ship it FREE of charge.)



Remove the "Safety Slides" - And pull off the rear of the frame.
(This one was damaged so I used it for a Focal Plane to hold a Ground Glass - But decided to use Plexiglas.


After cutting Plexiglas slide it into the Frame in the center - There are "guide-rails" where the aluminum sheets were that were removed.
You can use a Ground Glass - However, I choose the Plexiglas with Frosted Tape. It will not crack nor break.


Place a "dot" of wood glue on the rear part of the frame. Put together - Wipe excess off excess.
This is the Focal Plane.
Titebond III
ULTIMATE
Wood Glue

Take apart the wooden film holder by CAREFULLY Removing the Taped "Hinged Back Part" of the holder. Then Remove the Two (2) Inner Sheets of Aluminum that are Inside the holder. (I used a pair of needle-nosed plyers to Pull these out from the holder body. Some wooden film holders have little metal guides that the aluminum sheets fit into - You Want To Keep Those In Place in the holder.

NOW!!! I was going to use a sheet of Ground Glass cut to fit the area intended in the holder - However - I made the decision to use something else. "Plexiglas". Cut a small sheet of Plexiglas to Fit Exactly Into these guides. After making sure that the fit is good. Then Remove it, and use "FROSTED TAPE". Yes... I said use FROSTED TAPE over the Plexiglas for the focusing screen. WHY!!??!! = It will NOT break IF you Drop it. And I have used this before on my 4X5 and 8X10 cameras. After replacing the Plexiglas back into the wooden film holder, place a little wood glue on the fitted parts of the holder and place it back together with clamps to keep the hinged back from separating from each other. You will not have to do this part again. Uh!!! Unless you loose it.

Detail Showing "Home Position" Locking Pin
(This is done to NOT let the Box Slide Out)

Rear View of the "Locking-Pin" for Keeping The
Film Holder Door Closed When Exposing Film

Showing "Focus Wedge" In Place
To HOLD the focus selected

Upper Left - This is a "Movement Stop" for the "Home Position" (Closed at Infinitive Focus).

Upper Right - This is the "Locking" part of the Rear Door. This provides two things - To Hold The Film Holder In Place - And To Keep Out stray ambient Light from entering the Exposure area.

To the Left - Is shown the "Focus Locking Wedge" (After focusing on the subject, this part will Hold The Focus that the photographer selects.

All of these "Locking" parts should be secured with a string attached to the Pin and the camera body, as Not to loose them. (However - That is totally up to you, as the builder.)

NOTE - Most of these features were never found on the original sliding-box cameras. That is the why I have the "A" in the model numbers - Advanced.

After the first coat of Polyurethane, and when it is completely cured, lightly sandpaper with a very light grit 300 or finer. Finish with a light gentle, rubbing, with a "Scotch-Brite" scrubbing pad - And Go With The Grain of the wood, ALWAYS. I usually give it three (3) coats of Polyurethane, and each time give it a light rub with the "Scotch-Brite" pad. I have use glossy, however, I do prefer the Semi-Gloss better. After the final coat, I give it a good Paste Waxing. Be sure to let the wax dry completely before rubbing it off with a soft cottom cloth. I use my old "T"-shirts for this.

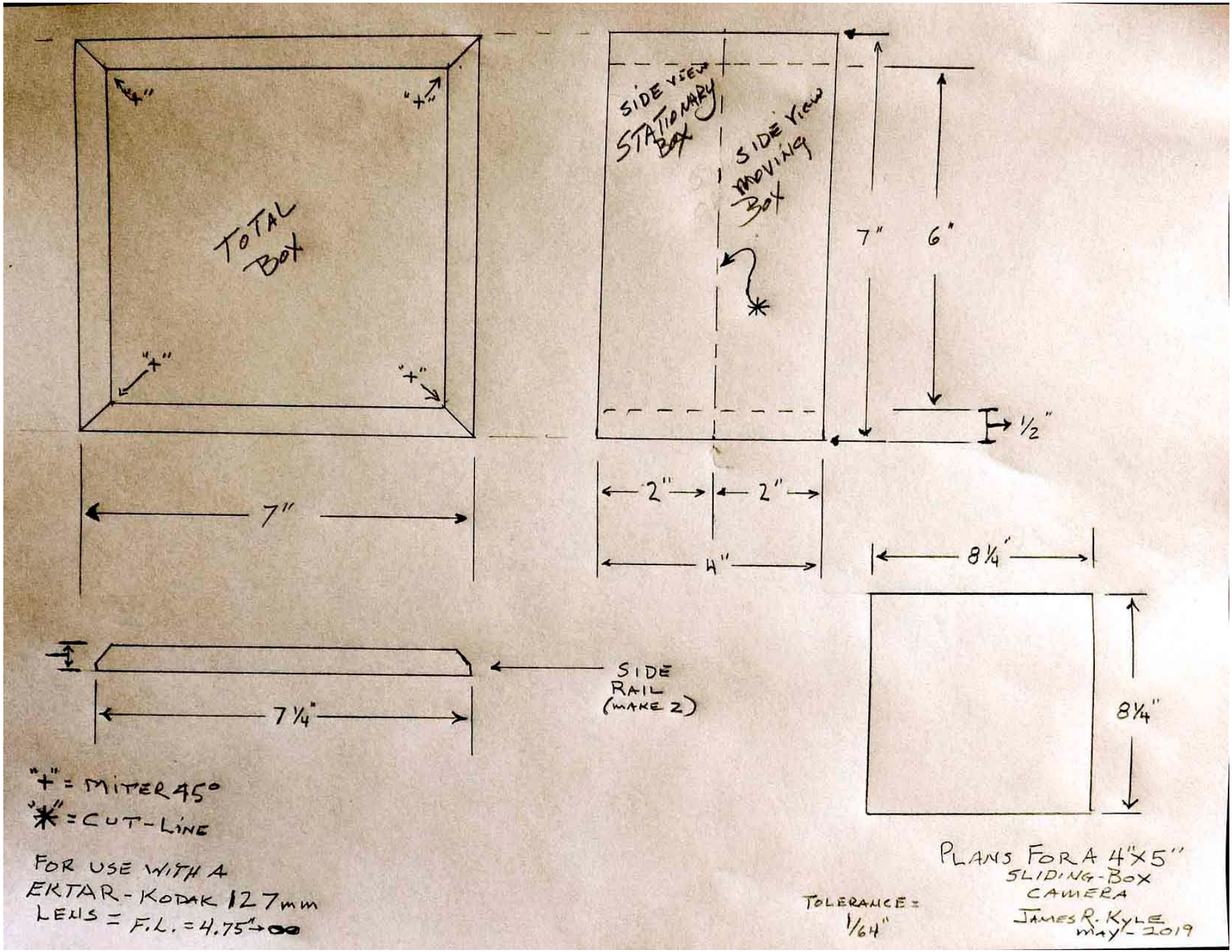
Testing is mandatory in that one must see how things worked out. I suggest that you use different f-Stops, and focus on different objects - far and near. This usually takes about 8 to 12 exposures. But You will know what is what with the your camera that you have built. Now you realize as to the why I enjoy making Paper Negatives - With My Own Cameras That I Built Myself.

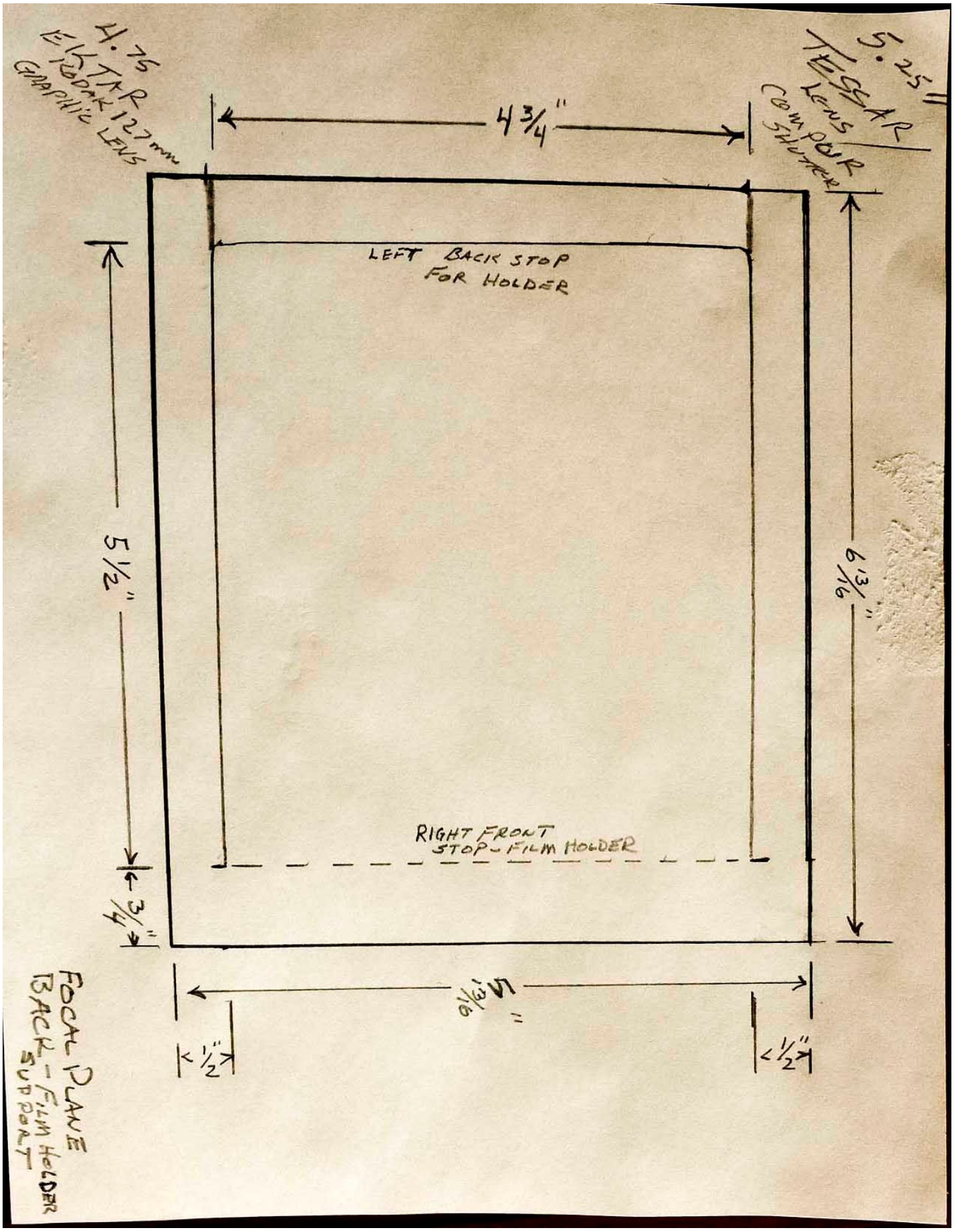
NOTE- Remember that in cutting the parts of wood to ALLOW for the thickness of the Saw blade Used. The "Inner" Part of the moving box dimensions are that of the moving box AND the Stationary Box. The dimensions are correctly found in the measuring of each inner part of each box. The Moving box will have glue applied to thin inner parts in order for the controlled sliding from the stationary box. Good Focus is achieved in this manner.

The inner glued box is made from 1/8 inch thin plywood - commonly called "Underlayment". You should NOT make miter 45 degree cuts on this wood. Use Butt-Joints, and perhaps small strips of wood to add strength to this Inner Box, and glue inside of Sliding box. Do Make SURE that ALL sides are SQUARE with Each other.

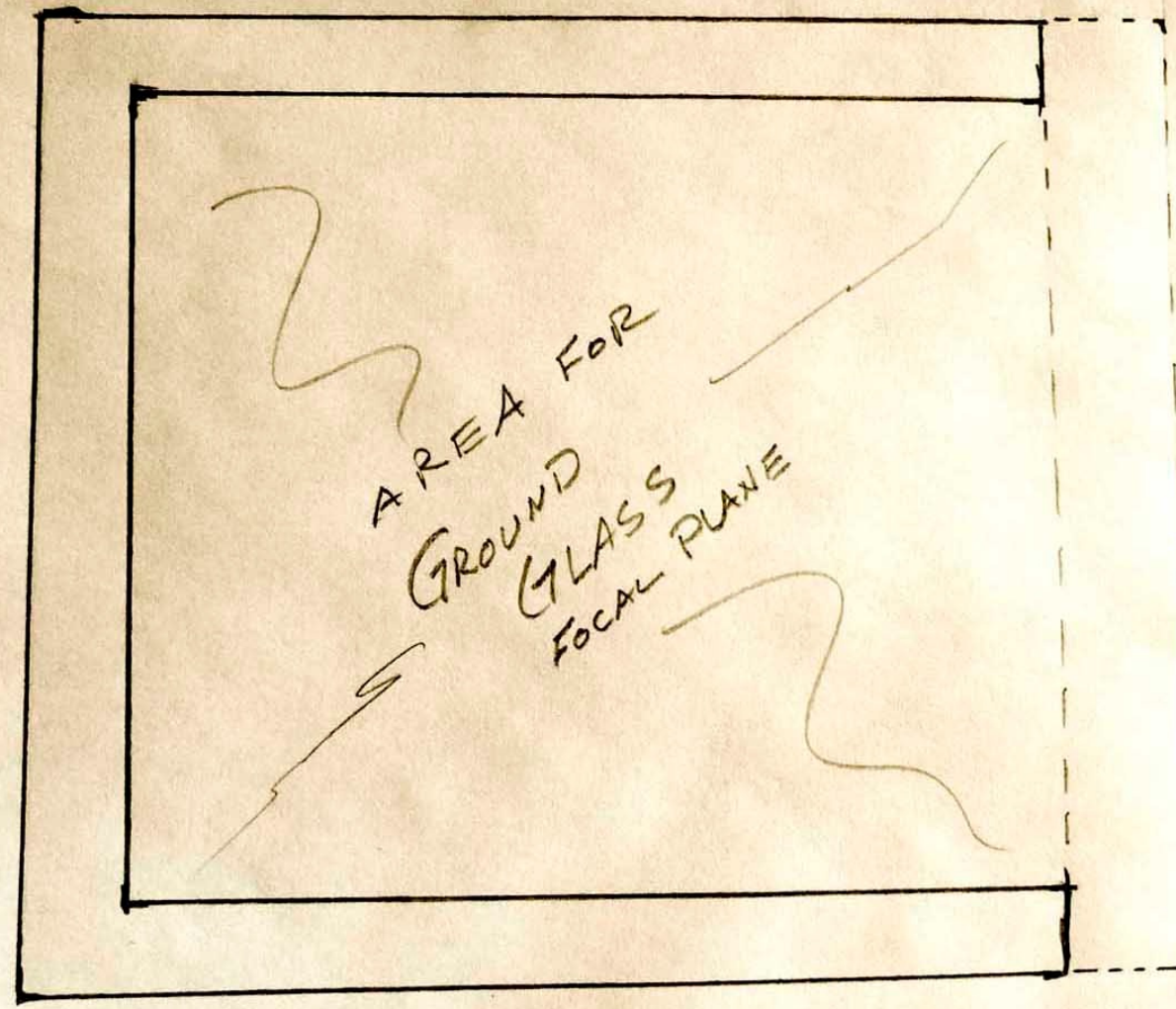
((Dimensional Drawings Attached))

James R. Kyle - May 2019 = Saint Louis, Missouri, U.S. of A.


TOTAL BOX
"+"
"+"
"+"
"+"
7"
SIDE VIEW STATIONARY BOX
SIDE VIEW MOVING BOX
7"
6"
1/2"
2"
2"
4"
8 1/4"
8 1/4"
SIDE RAIL (MAKE 2)
7 1/4"
"+" = MITER 45°
"*" = CUT-LINE
FOR USE WITH A EKTAR-KODAK 127mm LENS = F.L. = 4.75" → ∞
TOLERANCE = 1/64"
PLANS FOR A 4"X5" SLIDING-BOX CAMERA
JAMES R. KYLE MAY - 2019


4.75 Ektar Ektar 127 mm Graphlite Lens
5.25" Ektar Lens Compur Shutter
4 3/4"
LEFT BACK STOP FOR HOLDER
5 1/2"
6 13/16"
RIGHT FRONT STOP - FILM HOLDER
3/4"
5 13/16"
1/2"
1/2"
FOCAL PLANE BACK - FILM HOLDER SUPPORT

DRAWING #2



INSERT FOR
DRAWING #1

- Your NOTES -

((END))